1756HP-HTB-S

I/O SLAVE

USER MANUAL

Rev 1.4 – September 2005

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CHAPTER 1 INTRODUCTION

Hiprom presents the 1756HP-HTB-S Hitachi interface module. The 1756HP-HTB-S and the 1756HP-HTB-M [1] modules together provide an interface between existing Hitachi control systems and new Allen Bradley ControlLogix PLC's. The 1756HP-HTB-S (slave) module is able to emulate an entire I/O network, satisfying the Hitachi CPU's required connection to I/O. Reference can be made to Appendix A which details the HISEC IO network.

The module fits directly into any single slot within a ControlLogix System and is configured in RSLogix5000 using the Generic Profile. A Brad Harrison Nano-Change (M8) Receptacle provides a physical connection for the Hitachi signaling.

This document serves to describe the functionality, installation, configuration and use of the module.

[1] *Reference can be made to the 1756HP-HTB-M User Manual for detailed information regarding this manual*

CHAPTER 2 MODULE ACCESSORIES

Each 1756HP-HTB-S package includes the following components:

- **1756HP-HTB-S module**
- **2m Patch lead**

CHAPTER 3 MODULE OPERATION

The 1756HP-HTB-S module is designed to operate within the Allen-Bradley ControlLogix PLC system. All power required for the module's operation is derived from the 1756 backplane.

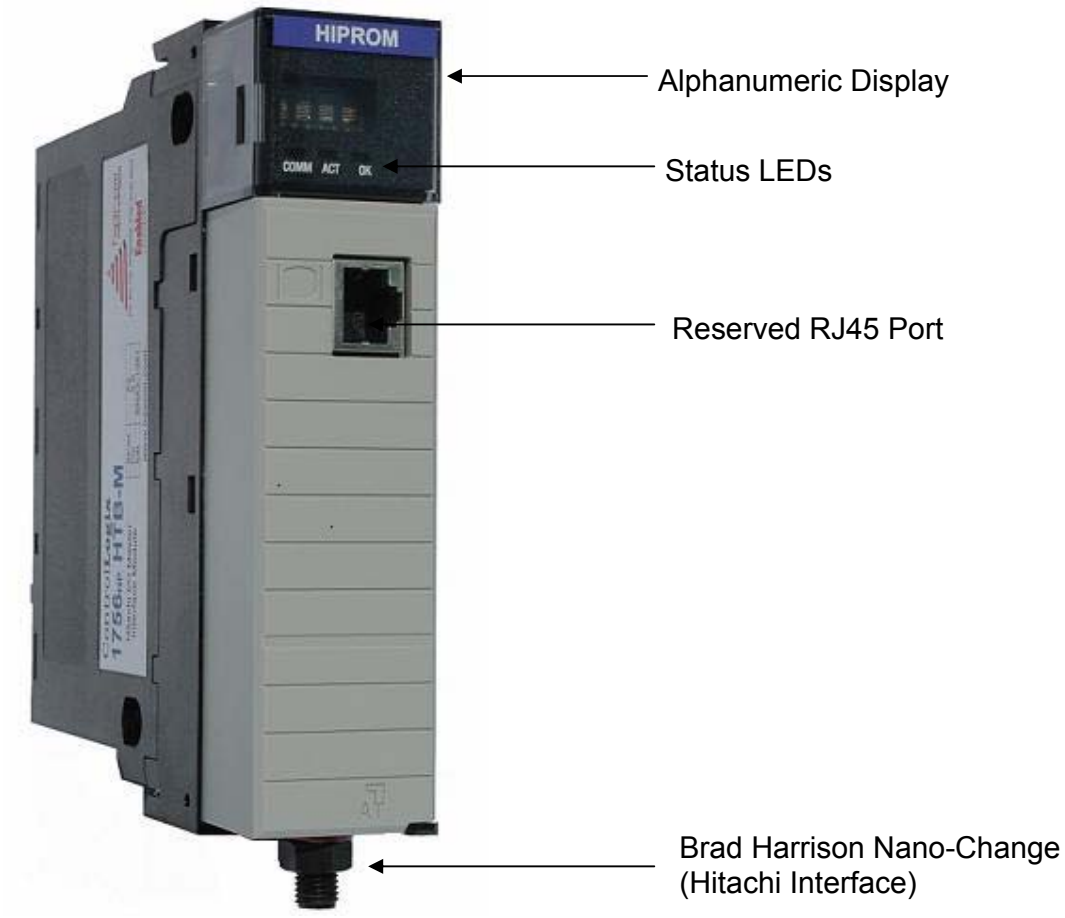


Figure 3.1 : 1756HP-HTB-S Layout

The current status of the module is conveyed to the user by means of the 3 bi-color Status LED's and the alphanumeric LED display. Appendix B details the various states of the LEDs and messages of alphanumeric display.

The following information is available to the user directly across the backplane by means of a scheduled connection:

- Hitachi I/O data (for a slot configured as an input module)
- Hitachi slot status information.

The Brad Harrison Nano-Change Receptacle located on the bottom of the module provides an external connection for the Hitachi interface. The board is accompanied with the respective 2m five core patch cable, of which the Hitachi cables are white and black.

CHAPTER 4 INSTALLING THE MODULE

The module is equipped with RIUP (Removal and Insertion Under Power) circuitry enabling the module to be installed or removed from the chassis while power is applied.

CHAPTER 5 CONFIGURING THE MODULE

A direct connection between the controller and the 1756HP-HTB-S module is required to transfer I/O data to and from the module.

5.1. Establishing the Direct Connection

This section describes the procedures necessary to configure the 1756HP-HTB-S module within the ControlLogix system. Each 1756HP-HTB-S module must be owned by a single ControlLogix controller.

The 1756 Generic Module is used in RSLogix5000 to configure the module. The configuration of the module is detailed in the table below.

Data Format			
CommFormat	Data – DINT		
Connection parameters			
Description	Instance	Size	
Input	1	32 (32 Bit)	
Output	2	32 (32 Bit)	
Configuration	4	12 (8 Bit)	
RPI			
Min	5 msec	Max	750.0 msec

Table 5.1 : 1756HP-HTB-S connection parameters.

The steps required to add a new 1756HP-HTB-S module are detailed below.

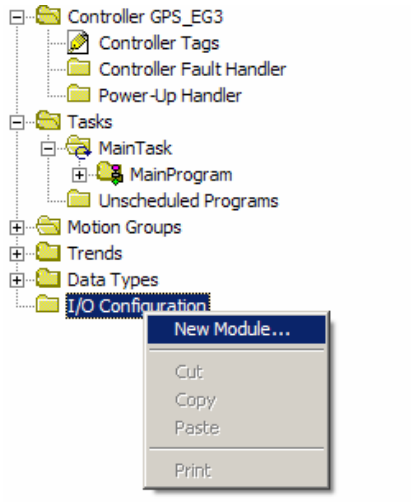


Figure 5.1 : Right-click on I/O Configuration and select New Module

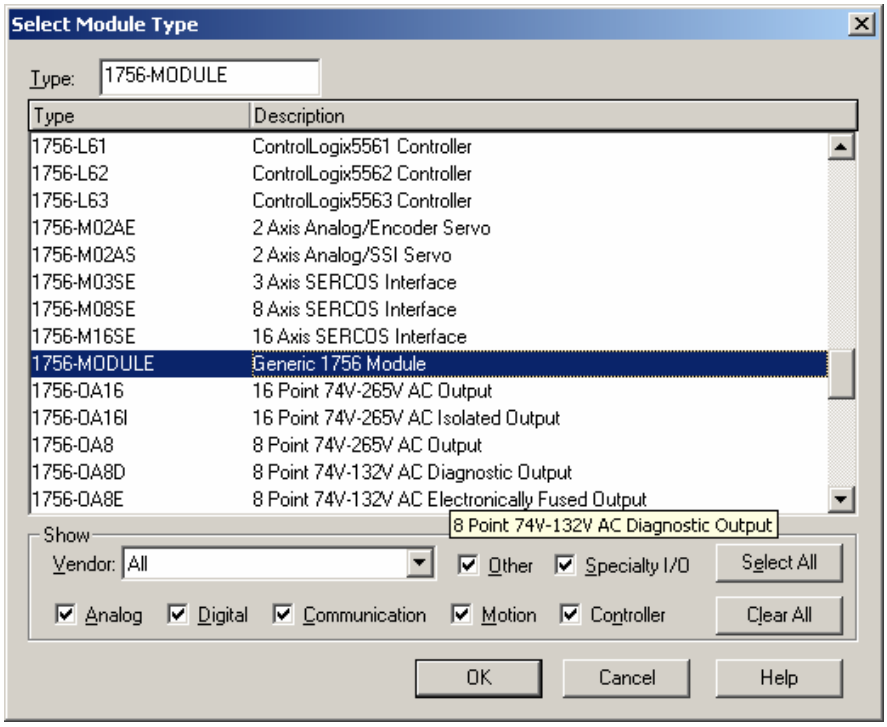


Figure 5.2: Select Generic 1756 Module (1756-MODULE)

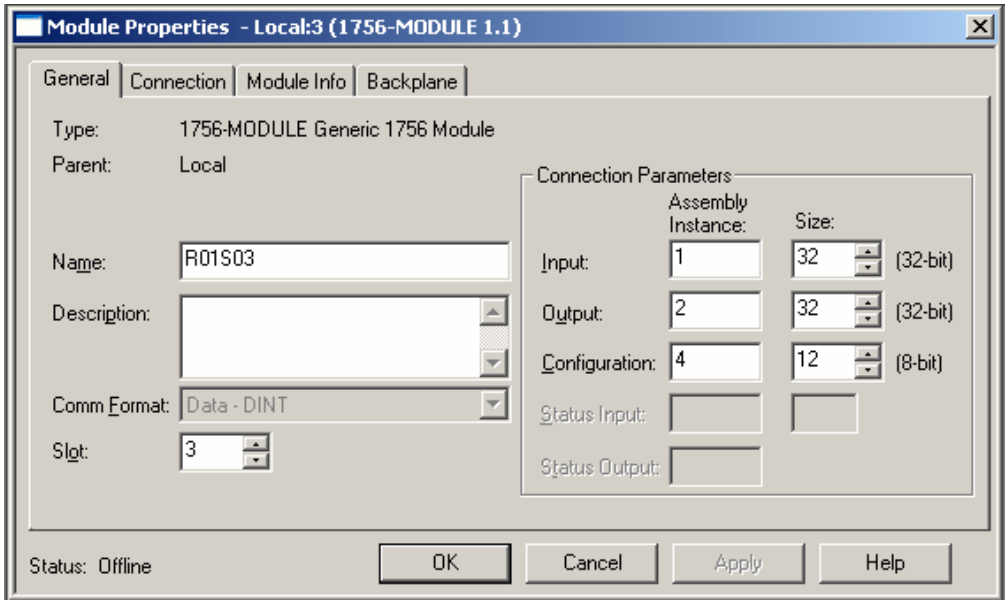


Figure 5.3: Configure module's parameters

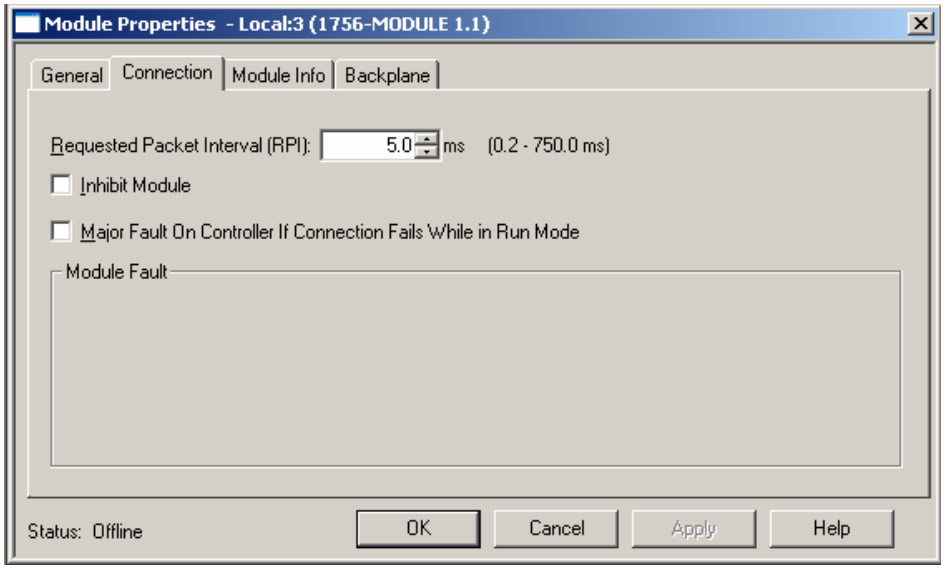


Figure 5.4: Configure module's RPI (Requested Packet Interval)

Before a connection is established between the 1756HP-HTB-S module and a ControlLogix processor, the Configuration data must be setup. The configuration data specifies the

- Enabled Hitachi I/O slots and direction as either an output or input
- Low, medium and high diagnostic thresholds.

The format of the configuration data is illustrated below.

BIT	7	6	5	4	3	2	1	0
BYTE	**I/0 Enable**							
0	S7E	S6E	S5E	S4E	S3E	S2E	S1E	S0E
1	S15E	S14E	S13E	S12E	S11E	S10E	S9E	S8E
2	S23E	S22E	S21E	S20E	S19E	S18E	S17E	S16E
3	S31E	S30E	S29E	S28E	S27E	S26E	S25E	S24E
	Input / Output							
4	IO7	IO6	IO5	IO4	IO3	IO2	IO1	IO0
5	IO15	IO14	IO13	IO12	IO11	IO10	IO9	IO8
6	IO23	IO22	IO21	IO20	IO19	IO18	IO17	IO16
7	IO31	IO30	IO29	IO28	IO27	IO26	IO25	IO24
	Diagnostic Threshold levels							
8	Low Threshold							
9	Medium Threshold							
10	High Threshold							
11	Reserved							

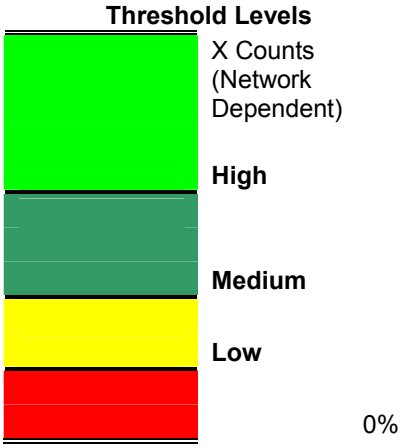
The first 4 bytes (S**n**E where n = Extended Slot number) of the Configuration Image indicate the Hitachi enabled slots.
"1" = Enabled,
"0" = Disabled

The next four bytes (IO**n** where n = Extended Slot number) of the Configuration Image specify whether the enabled slots are either of type Input or Output:

"1" = Output
"0" = Input

Note: The 1756HP-HTB-M can only support 30 slots (i.e 0..29)

The remaining fields to be configured are those of the threshold levels. The module continuously records the number of successful transactions for each enabled slot within a specific time frame. The thresholds levels that are specified within the configuration file create ranges as illustrated below that are then used for diagnostic display purposes (refer to Appendix B).



Once a module's configuration data has been downloaded to the controller, it will establish a connection with the module. Should the configuration of the 1756HP-HTB-S change, the module will need to be reset. A connection will fail if there is inappropriate configuration data, this includes:

- The specified size of the Input, Output, or Configuration size is incorrect
- The assembly instance of the input, Output and Configuration is incorrect
- An RPI that does not fall within the specified range

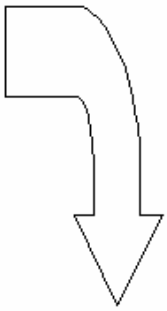
The module utilizes a system watchdog to ensure the integrity of the connection to the controller, refer to the Output Image.

CHAPTER 6 I/O ADDRESS MAP

The input and output image of the 1756HP-HTB-S module is defined in the following sections.

6.1. Input Image

WORD	DESCRIPTION
0	Slot 0 Output and status data
1	Slot 1 Output and status data
2	Slot 2 Output and status data
3	Slot 3 Output and status data
4	Slot 4 Output and status data
5	Slot 5 Output and status data
6	Slot 6 Output and status data
..	
27	Slot 27 Output and status data
28	Slot 28 Output and status data
29	Slot 29 Output and status data



BIT	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DESCRIPTION	Transcount								Reserved				Timeout	Status	Direction	Enabled	Input Data															

Figure 6.1 : Connected Input Image

6.2. Input Image Description

Field/Value	Description	Location	Type
Data	**Output Data** **If module is configured as an output this field reflects the current data of the associated output Hitachi slot. If the associated Hitachi slot is configured as an input, the data will display 0x0000**	**Local:s:I.Data[n].0..15**	INT
Enabled	**Slot Enable** 0 = Hitachi Slot not enabled 1 = Hitachi Slot is enabled	**Local:s:I.Data[n].16**	BIT
Direction	**Slot type: Indicates the direction / type of module located in the associated slot** 0 = Input module 1 = Output module	**Local:s:I.Data[n].17**	BIT
Status	**Module status: Should the module in the associated slot be enabled this bit indicates the current status of that module** 1 = Associated slot is operating correctly 0 = Associated slot has faulted. One can refer to the Timeoutand Transcount for further details.	**Local:s:I.Data[n].18**	BIT

Timeout	**Timeout bit: Indicates that a response was not received from the associated slot within a specific timeframe.** 1 = No fault, data received 0 = No response was received from the associated slot	**Local:s:I.Data[n].19**	BIT
Transcount	**Count of successful transactions with the respective extended slot within a given time frame.**	**Local:s:I.Data[n].24..31**	SINT

Warning:
It is important to ensure that the diagnostic status information is used in the PLC logic in order to detect possible module or network failure. Failing to do so could result in possible equipment damage or personal injury

6.3. Output Image

Words 0..29

BIT	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
WORD																																		
0	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 0 Input Data
1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 1 Input Data
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 2 Input Data
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 3 Input Data
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 4 Input Data
5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 5 Input Data
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 6 Input Data
..																																		
20	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 20 Input Data
21	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 21 Input Data
22	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																	Slot 22 Input Data

Should a slot be configured as an input, the respective output word will read the input data. The card uses this data to emulate the input network, satisfying the Hitachi CPU's connection to the network. Thus, assuming slot 6 of the Hitachi network has been configured as a Hitachi input card, the data corresponding to the slot can be written to *Local:s:O.Data[6].*

Field	Description	Location	Type
Output Data	Input data to be written to a Hitachi CPU.	**Local:s:O.Data[n]0..15**	INT

Word 30
WatchDog

Word 30 (*Local:s:O.Data[30])* of the output image is reserved for a watchdog. The watchdog ensures that the connection with the controller has been established and continues to remain connected, thus ensuring that no inaccurate data can be written/read to/from the Hitachi network.

The watchdog is an integer (word) that must be changed within every 10ms. Should the value not change the module will fault and this will be indicated via the alphanumeric display and LED statuses. Transactions with the Hitachi Network will terminate when the watchdog has faulted, and resume once the watchdog begins updating again.

APPENDIX A OVERVIEW OF HISEC IO NETWORK

Network Topology

The Hitachi HISEC I/O network is a single master, multiple slave network connected by means of a multi-dropped single pair of wires.

The master, typically an H02 CPU or a CE module connected to an H04 CPU, is responsible for interrogating (inputs) and commanding (outputs) on each logical slot on the network. Each slot is processed in logical slot ascending order although the protocol does not require this. That is, slot 0 is processed, then slot 1, and so on. After slot 31 has been processed it rolls over to slot 0 and the sequence is repeated.

The logical slot number (0-31), also referred to as the extended slot number, is the unique slot address on the network. For the first rack on the network, (station address zero), it is simply the physical slot number, numbering from 0 (on the left) to n-1 (on the right), where n is the number of logical slots in the physical rack. For subsequent racks, where the rack station address is greater than zero the extended slot number can be calculated as follows :

Extended Slot = (ST * 2) + y

Where :

ST = station address as configured by the ST dial on the rack controller (PST360) module, y = physical slot number (0 through n – 1, where n is the logical rack size)

The network does not differentiate on how the logical address is determined. For example, the modules in one 8 slot rack (with ST = 0), are addressed in the exact same manner in which two 4 slot racks (with ST = 0 and ST = 2 respectively) are addressed.

APPENDIX B MODULESTATUS

The following sections describe the status indicators of the module :

Status LEDs

LED	DESCRIPTION	STATUS	MEANING
OK	Module Status	Solid Red	Initialization or Watch Dog Fault
		Flashing Red	Major Fault
		Flashing Green	Minor Fault
		Green	Module operating correctly
ACT	Enabled Slots	Solid Red	Watchdog Error or No slots enabled
		Green	Slots Enabled with no watchdog error
COM	All Slots OK	Solid Green	All enabled slots communication operating correctly
		Solid Red	A timeout has occurred for the update time for one or more of the enabled slots

6.4. Status Display

Init	**Initialization of Module** The module is initialized only on power-up.
Frn	**Firmware Revision** The firmware revision number is displayed on power-up.
WDog	**WatchDog** Watchdog fault
nn✓✓	Successful Transactions between High threshold and 100% (nn = Extended slot)
Nn ✓	Successful Transactions between Meduim and High threshold (nn = Extended slot)
nn X	Successful Transactions between Low and Medium threshold (nn = Extended slot)
nnXX	Successful Transactions between 0% and Low threshold (nn = Extended slot)

APPENDIX C RECOMMENDED DATA STRUCTURES

This Appendix provides a detailed description of recommended data structures that can be used.

Name	Datatype	Style
EnableSlot	BOOL[32]	Decimal
TypeSlot	BOOL[32]	Decimal
ThresholdLow	SINT	Decimal
ThresholdMed	SINT	Decimal
ThresholdHigh	SINT	Decimal

Table D.1: Slave Module Configuration Data Structure

Name	Datatype	Style
InputData	INT	Decimal
Enabled	BOOL	Decimal
Direction	BOOL	Decimal
Status	BOOL	Decimal
TimeOut	BOOL	Decimal
Reserved0	BOOL	Decimal
Reserved1	BOOL	Decimal
Reserved2	BOOL	Decimal
Reserved3	BOOL	Decimal
TransCount	SINT	Decimal

Table D.2: Slave Module Input Image Word Structure

Name	DataType	Style
Data	INT	Decimal
Reserved	INT	Decimal

Table D.3: Slave Module Output Image Word Structure

APPENDIX D SPECIFICATIONS

Parameter	Specification
General	
Module Location	Any Slot
Electrical	
Backplane Current	515mA @ 5.1V
	3mA @ 24V
Schedules Connection Parameters	
RPI	5ms to 750ms